Tungsten Mining (TGN)

Assessing a high-grade tungsten prospect in WA
with potential for rapid development

Recommendation: Speculative BUY

Key Points:

- TGN listed on the ASX in Dec 2012, raising $5.1 million
- Its 100%-owned Kilba project covers a high-grade tungsten exploration target of 1.2-1.4 million tonnes at 0.6-0.8% WO₃
- Zone 11 at Kilba occurs at ‘open-pit’ depths and historic analysis indicates a high metallurgical recovery rate (~84%)
- Zone 11 is located within a granted Mining Licence
- TGN is aiming to commence WO₃ production by the end of 2014

Tungsten Mining (ASX: TGN) is advancing assessment of its flagship Kilba Project (100%) in the Gascoyne region of Western Australia, with the aim of making a rapid transition to production. To that end, the Company expects to define a JORC compliant resource during the June quarter 2013 and has already commenced feasibility studies that will continue through to Sept quarter 2013. TGN expects to be in the position to make a final investment decision (FID) in first quarter of 2014, which could result in first WO₃ concentrate production as soon Sept quarter 2013.

Company Overview:

Tungsten Mining (ASX: TGN) is a tungsten-only explorer that is primarily focused on developing its high-grade Kilba Project (100%), located in the Gascoyne region of WA. Kilba represents a high-grade, near-surface exploration target of 1.2-1.4 million tonnes (Mt) at 0.6-0.8% WO₃, based on historic exploration conducted in the 1980s.

After listing in December 2012, raising A$5.1 million in the process, TGN commenced Phase 1 of its reverse circulation (RC) and diamond drilling program. Phase 1 returned some promising high-grade, wide intercepts at shallow (open-pit) depths, including 14.5m at 0.80% WO₃ (from 42.5m). These results replicated the historic drilling results across the same cross sections. With the completion of the Phase 2 and 3 drilling programs, TGN is aiming to define a JORC-compliant resource by April 2013.

The Company plans to undertake feasibility studies over the next four to six months, with the aim of defining an operation capable of producing up to 100,000 MTU WO₃ p.a. for a low capital expenditure (CAPEX) in the order of ~US$30 million. Such an operation could generate $28 million p.a. in revenue at the current WO₃ concentrate price.
**Investment Review**

Kilba (100% TGN) is one of the few high-grade undeveloped open-pit tungsten deposits outside of China, the world’s largest producer (~87% global output in 2010). Historic drilling has outlined a shallow, high-grade target that could potentially be developed into a mine before the end of next year. Given the strong outlook for tungsten (W) and the lack of supply security for tungsten end-users, TGN should be well positioned to secure finance. Furthermore, with the Managing Director’s track record of bringing tungsten projects to production, we believe TGN has the unique combination of high-quality assets in a buoyant market, and an ability to deliver on ambitious targets.

**Exposure to tungsten – strong price outlook**

TGN presents a rare exposure to near-term production of tungsten within Australia. China is effectively choking off the global supply of tungsten by banning exports of tungsten concentrate in an attempt to conserve their domestic reserves and to subsidise domestic value addition to the commodity. As a result of these policies, China became a net importer of tungsten concentrate in 2012. Up until at least 2015, the supply deficit outside of China is expected to widen further.

**Identified rare open-pit, high-grade mineralisation**

High-grade, open-pit tungsten mines are rare outside of China and exploration to date at the Kilba Project has identified high-grade, near-surface mineralisation. Phase 1 drilling has confirmed historic results, including:

- 3.25m at 0.95% WO₃ (from 9.9m),
- 14.5m at 0.80% WO₃ (from 42.5m), and
- 7.4m at 1.06 WO₃ (from 82.8m).

**Potential acquisition target & financing options**

With China restricting the global supply of tungsten concentrate, western consumers and fabricators are looking to secure new (alternative) supply sources. As a result, such end users present a solid opportunity for TGN to secure project support through both equity and debt financing of the development phase of the mine on favourable terms. TGN’s MD Paul Berndt has previous experience in the development of tungsten mines and has good contacts for securing financing opportunities.

**Experienced MD with relevant tungsten expertise**

TGN’s MD Paul Berndt is a metallurgist with over 35 years’ experience in project development, mining operations and process engineering all over the world. Paul has a thorough understanding of tungsten mining and the market for tungsten. He was previously the MD and General Manager of a tungsten mining operation in Spain. The mine had a very similar skarn ore body to Kilba. While that mining operation is about three times the size of what Kilba is expected to be, it has a much lower recovery rate and its tungsten output is lower overall.
Investment Review

Near-term price catalysts – resource definition and production

TGN has a strong pipeline of near-term price catalysts for shareholders, including Phase 2 drilling results, which are expected to be released imminently, resource and reserve definition in Q2 2013 and feasibility study results throughout 2013 (see Figure 1). TGN has the potential to become a profitable tungsten miner in a short time frame. The Company estimates that upon completion of feasibility studies, it could take as little as 10 months to construct a mine and a processing plant, meaning that TGN could commence mining tungsten before the end of 2014.

Figure 1: Project Development Timeline

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<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
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<td>Production</td>
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</table>

Source: Tungsten Mining

Unlike its ASX-listed peers, TGN has not yet completed an extensive drilling program, so there is upside potential in their Kilba project as the results of the Phase 2 and Phase 3 drilling programs are returned. Furthermore, the current exploration target is only for Zone 11 of the Kilba project, and does not include Zone 8 and Zone 12, where historic drilling has returned significant high-grade intercepts. TGN has not yet drilled any of these highly-prospective zones, outside of Zone 11.

Tungsten Mining resource/target peer comparison

In comparison to its ASX-listed exploration and development stage peers:

- TGN’s Kilba potentially contains a significantly higher grade (0.6-0.8% WO₃) of mineralisation than any other tungsten resource in Australia, aside from King Island Scheelite (ASX: KIS) Dolphin project in Tasmania (0.90% WO₃), which is an expensive underground mining proposition.
- Kilba has a very high estimated recovery rate of 84%, based on historical test results, compared to 60-70% for its peers (TGN estimate).
- Kilba an open-pit exploration target, which is very rare outside China. Most of TGN’s ASX peers have resources that are underground or are a combination of underground and open-pit.
- However, Kilba has a smaller size potential than many of its peers and its exploration and assessment is still at a relatively early stage.

High recovery rates, a likely open-pit mine and high-grade mineralisation are all characteristics that should contribute to a favourable operating cost structure for the Kilba Project and hence it is well placed to emerge at the low end of the cost curve for tungsten concentrate producers.
**Table 1: ASX Peer Analysis**

<table>
<thead>
<tr>
<th>Project</th>
<th>Company</th>
<th>EV (A$m)</th>
<th>Resource</th>
<th>Grade % WO₃</th>
<th>Contained WO₃</th>
<th>Output p.a.</th>
<th>Start Up</th>
<th>EV/MTU WO₃ (A$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilba, WA</td>
<td>Tungsten Mining (TGN)</td>
<td>A$8.4m</td>
<td>1.2-1.4Mt (target)</td>
<td>0.6-0.8%</td>
<td>7,200-11,200t</td>
<td>1,000t WO₃</td>
<td>Q4 2014</td>
<td>A$7.49-A$11.65</td>
</tr>
<tr>
<td>Mt. Carbine, Qld</td>
<td>Carbine Tungsten (CNQ)</td>
<td>A$18.6m</td>
<td>39Mt</td>
<td>0.14%</td>
<td>54,600t</td>
<td></td>
<td>Q1 2012</td>
<td>A$7.10</td>
</tr>
<tr>
<td>Hemerdon, U.K.</td>
<td>Wolf Minerals (WLF)</td>
<td>A$62.5m</td>
<td>410Mt</td>
<td>0.13%</td>
<td>522,000t</td>
<td>2,750t W</td>
<td>Q4 2013</td>
<td>A$1.20</td>
</tr>
<tr>
<td>Molyhil, WA</td>
<td>Thor Mining (THR)</td>
<td>A$3.48m</td>
<td>4.7Mt</td>
<td>0.28%</td>
<td>13,100t</td>
<td>1,750t WO₃</td>
<td>Q4 2013</td>
<td>A$2.66</td>
</tr>
<tr>
<td>Cookes Creek, WA</td>
<td>Hazelwood Resources (HAZ)</td>
<td>A$21.5m</td>
<td>16.2Mt</td>
<td>0.16%</td>
<td>25,426t</td>
<td>1,600t WO₃</td>
<td>2015</td>
<td>A$8.46</td>
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<tr>
<td>Watershed, Qld</td>
<td>Vital Metals (VML)</td>
<td>A$7.8m</td>
<td>15.1Mt</td>
<td>0.46%</td>
<td>69,300t</td>
<td>1,000t WO₃</td>
<td>2014</td>
<td>A$1.10</td>
</tr>
<tr>
<td>Mt. Lindsay, Tas</td>
<td>Venture Minerals (VMS)</td>
<td>A$44.3m</td>
<td>8.6Mt</td>
<td>0.28%</td>
<td>24,080t</td>
<td>1,500t WO₃</td>
<td>2014</td>
<td>A$18.4</td>
</tr>
<tr>
<td>Dolphin, Tas</td>
<td>King Island Scheelite (KIS)</td>
<td>A$5.87m</td>
<td>9.1Mt</td>
<td>0.90%</td>
<td>81,720t</td>
<td>3,550t WO₃</td>
<td>2015</td>
<td>A$0.71</td>
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<tr>
<td><strong>Average (Ex. TGN)</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.34%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>A$5.66</td>
</tr>
</tbody>
</table>

*Source: Metal Pages, company announcements and Breakaway Research*

**TGN company peer comparison**

In comparison to its ASX-listed exploration and development stage peers:

- **KGN has a mining lease over its exploration target**
  - TGN has already secured a Mining Lease (ML) over Kilba, while many early-stages ASX peers do not have MLs in place, potentially impacting the approvals timeframe.

- **TGN has a 100% interest in most projects, providing flexibility**
  - TGN has a 100% interest in all its projects, aside from Callie Soak, which has the benefit of a greater return on success and the flexibility to attract partners for financing or operational expertise.

- **TGN’s MD has direct tungsten operational expertise.**
  - TGN’s Managing Director has direct operational and development experience in the tungsten space. It is difficult to find management with comparable tungsten experience within TGN’s ASX-listed peers.
  - TGN has a large suite of tungsten prospects that merit drill testing and add potential (long-term) upside for shareholders.
Project Review

Location & Infrastructure

TGN’s flagship Kilba (100% TGN) project is located in the Gascoyne region of WA, which also hosts the Company’s Love’s Find prospect and several other potential projects. Together, the nine Gascoyne tenements cover a large 240km² area and include three mining leases (MLs), over which tungsten mineralisation has been identified. The Kilba project hosts an exploration target of 1.2-1.4Mt at 0.6-0.8% WO³ of skarn-style mineralisation, similar to many tungsten deposits worldwide, including the Los Santos mine in Spain. The target is located within a granted Mining Licence (ML 08/0314).

Figure 2: Kilba Project Area Mineralisation Map

Source: Tungsten Mining

Previous Exploration & Metallurgy

Kilba was previously explored by Union Carbide up to the 1980s (see Figure 3). Historic metallurgical testing estimated a high recovery rate of ~84%, due to the WO³ mineralisation being coarse grained and, therefore, simpler to process. Historic drilling by Union Carbide provided the foundation for TGN to define an exploration target of 1.2-1.4Mt at 0.6-0.8% WO³.
**Project Review**

**Figure 3: Kilba Historic and Recent Drilling Results**

Source: Tungsten Mining

**Drilling Program – Stage 1**

TGN completed its Phase 1 diamond drilling program in January 2013, which confirmed both the high-grade historic results and the thickness of the mineralised intervals (see Figure 4). Some of the better intercepts included 14.5m at 0.80% WO₃ (from 42.5m) and 7.4m at 1.06% WO₃ (from 82.8m).

These results are high-grade in comparison to typical results from other ASX-listed tungsten explorers and developers – which have an average resource grade of 0.34% (see Table 1, p.4), as well as existing open-pit tungsten mines. The cut-off grade for mines outside of China averages ~0.1% WO₃ for open pit and ~0.5% WO₃ for underground operations.

**Table 2: Zone 11 Prospect, Selected Phase 1 Drilling Intercepts**

<table>
<thead>
<tr>
<th>Hole ID</th>
<th>From (m)</th>
<th>Interval (m)</th>
<th>WO₃ (%)</th>
</tr>
</thead>
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<tr>
<td>KDD0001</td>
<td>9.9</td>
<td>19.6</td>
<td>0.38%</td>
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<tr>
<td>KDD0001</td>
<td>9.9</td>
<td>3.25</td>
<td>0.95%</td>
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<td>KDD0002</td>
<td>82.8</td>
<td>7.4</td>
<td>1.06%</td>
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<td>KDD0003</td>
<td>42.5</td>
<td>14.5</td>
<td>0.80%</td>
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<td>7.6</td>
<td>1.24%</td>
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<td>120.45</td>
<td>0.45</td>
<td>3.25%</td>
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<td>KDD0005</td>
<td>59.3</td>
<td>1.7</td>
<td>0.42%</td>
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<tr>
<td>KDD0007</td>
<td>100.95</td>
<td>4.05</td>
<td>0.34%</td>
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<tr>
<td>KDD0009</td>
<td>73.4</td>
<td>2.3</td>
<td>0.76%</td>
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</tbody>
</table>

Source: Tungsten Mining

In the Stage 1 program TGN sought to confirm historic drill results at Zone 11 by selectively drilling twin holes and this work has been successfully completed with positive results.

Figure 4 is a cross-section illustrating the wide zones and continuity of mineralisation present.
Project Review

Drilling has uncovered wide zones of tungsten mineralisation

Drilling Program - Phase 2 and 3

The Company is now undertaking Phase 2 and Phase 3 rounds of drilling, with the aim of completing a JORC-compliant resource estimate.

- Phase 2 involves RC and diamond drilling over an 800m strike length of the target horizon on 80m sections to better define the known mineralisation.
- Phase 3 involves infill RC and diamond drilling on selected 40m sections, with the aim of improving the confidence of any resource estimate.

TGN expects to complete both drilling programs by the end of April 2013.

Metallurgical Testing and Feasibility Studies

TGN has already completed large-diameter core drilling to extract samples for metallurgical testwork. The Company is seeking confirmation that it can achieve metallurgical recoveries in line with the indicative recovery rate of 84% made by Union Carbide in the 1980s. After determining the metallurgical characteristics of the ore TGN’s mineral processing consultant, Mintrex, will design and cost an appropriate process flow sheet.

Aiming to become a low CAPEX, near-term, producer

TGN is aiming to undertake feasibility studies over the next four to five months, with the aim of establishing an operation producing up to 100,000 MTU WO₃ p.a. for a low capital expenditure (CAPEX) in the order of ~US$30 million. Such an operation would generate revenue of ~$28 million p.a. at the current WO₃ concentrate price.

The construction period for Kilba could be as short as 10 months, according to TGN. Furthermore, since the lead time to mining is minimised because Kilba is located within a granted Mining Licence, the Company is able to fast track the approvals process for commencement of mining operations. TGN is targeting commencing production of WO₃ concentrate as soon as the end of 2014.
Project Review

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<th>Phase</th>
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Source: Tungsten Mining and Breakaway Research

Other Projects

Love’s Find

Tungsten mineralisation at Love’s Find occurs in the form of scheelite on ML M08/0493 and is, similarly to Kilba, associated with the intruding Kilba granite. Surface grab samples have returned grades up to 5.6% WO$_3$. While there is substantial visual evidence of widespread occurrences of the prospective skarn horizons surrounding Love’s Find, the prospect has not been systematically mapped or evaluated using modern geophysical techniques. There is also no record of historic drilling.

Mosquito Creek Project

Located 85km southeast of Tennant Creek, in the Northern Territory, the Mosquito Creek Project comprises three exploration licences that cover ~277km$^2$ within the historic Mosquito Creek Tungsten Field. Tungsten mineralisation (both wolframite and scheelite) is known to occur at several locations regionally (see Figure 6). Mosquito Creek was mined for tungsten between 1951 and 1956.

Surface grab samples have returned grades up to 5.6% WO$_3$
**Project Review**

**Koolyanobbing Project**

The Koolyanobbing Project (100% TGN) is located 45km northeast of Southern Cross, adjacent to the township of Koolyanobbing, in WA. The project tenements extend over a 70km strike, overlying and adjacent to the regional Koolyanobbing Fault. Scheelite mineralisation has been traced along the fault over a strike length of more than 5km. From a historic sample that assayed 2.5% WO₃, a concentrate grading 65% WO₃ was produced at an estimated recovery of between 70-80%.

**Callie Soak Project**

The Callie Soak project is located ~11km northwest of the abandoned Big Bell Mining Centre in the Murchison region of WA. The project comprises an Exploration Licence (EL) and an EL application. TGN has the right to a 20% free carried interest in the project through to completion of a feasibility study.

Previous drilling at the Martin’s Lode lens (adjacent to Callie Soak) highlighted several wolframite-bearing lenses at encouraging grades. The most recent drilling program, in 1970 concluded that an increase in the tungsten price (at that time US$47-61/MTU of WO₃) was needed before the site could be economically mined. Drill hole material was examined in 1970 and it was concluded that final concentrate assays of at least 68.5% WO₃ could be obtained.

**Figure 7: Mineralisation and Drilling Map, Callie Soak**

![Mineralisation and Drilling Map, Callie Soak](source: Tungsten Mining)
**Commodity Overview**

**The Fundamentals of Tungsten**

Tungsten (wolfram, W) has an atomic number of 74 and sits within Group 6 of the periodic table. The metal has a very high density of 19.3g/cm³ (same as gold), the lowest coefficient of expansion of any pure metal and at 3410°C has the highest melting point of any of the metallic elements. Tungsten has a boiling point of 5555°C which is a temperature comparable to the surface of the sun.

Tungsten occurs in nature only in the form of minerals. Although more than thirty tungsten bearing minerals are known, only two of them are important for economic use, namely wolframite and scheelite.

Long before the element ‘tungsten’ (from the Swedish tungsten, meaning heavy stone) was discovered (1783), the mineral wolframite was known in the tin mines. The name Wolfram is derived from the Latin words for ‘wolf’s foam’ and insinuates “the wolf that devoured tin”. During the early day processing of tin ore, the ‘foam’ formed on the molten tin and reduced the tin recovery.

**Tungsten mineralisation characteristics**

<table>
<thead>
<tr>
<th>Name</th>
<th>Chemical Formula</th>
<th>%WO₃</th>
<th>Colour</th>
<th>% Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wolframite</td>
<td>(Fe, Mn) WO₄</td>
<td>76.50%</td>
<td>Black</td>
<td>25%</td>
</tr>
<tr>
<td>Scheelite</td>
<td>CaWO₄</td>
<td>80.50%</td>
<td>White</td>
<td>75%</td>
</tr>
</tbody>
</table>

Source: ITIA

The average concentration for tungsten in the earth’s crust is 1.5ppm and all primary deposits are of magmatic or hydrothermal origin. During cooling of the magma, differential crystallisation occurs. Scheelite and wolframite are often found in veins where the magma has penetrated cracks in the earth’s crust. Deposits typically occur throughout the younger mountain ranges; with China possessing over 60% of the world’s known reserves. Of the known ore deposits, 75% are scheelite and 25% are wolframite. Wolframite concentrates tend to attract a premium in the market.

Pure scheelite has a blue-white fluoresce in ultraviolet light, a property which is utilised in prospecting. Wolframite is a general term for iron and manganese tungstates where the iron/manganese ratio can vary. A mineral with more than 80% FeWO₄ is called Ferberite and a mineral with more than 80% MnWO₄ is called Hübnerite.

At temperatures above 1,650°C, tungsten has the highest tensile strength of all metallic elements in pure form. Alloying small quantities of tungsten in steel greatly increases its toughness. Tungsten drill bits have the highest wear resistance and are not substitutable. Most of tungsten’s unique properties are due to the half filled 5d electron shell with a very high binding energy of the tungsten metal lattice. Based on these properties, many compounds cannot be substituted in many important applications in different fields in modern technology.

The price of tungsten is best followed by Ammonium Paratungstate (APT) \([\text{(NH}_4\text{)}_{10}\text{[H}_2\text{W}_{12}\text{O}_{42}]:4\text{H}_2\text{O}]\) which is an intermediate tungsten product and acts as one of the industry’s main reference pricing products.
Commodity Overview

The Uses of Tungsten

About 56% of tungsten consumption is in the form of Tungsten Carbides for use in cutting and drilling tools. These carbides are made by ‘cementing’ hard tungsten grains in a binder matrix of tough cobalt metal by liquid phase sintering. This product is considered to be one of the hardest and most durable of all metals. The military use of tungsten carbide is for armour-piercing rounds, while light bulb manufacturers use the tungsten metal for filaments within incandescent light bulbs due to its resistance to heat.

Global primary tungsten consumption by end use sector

The airline industry also has a high reliance on tungsten. The superalloy turbine blades within the jet engines have high concentrations of tungsten as they need characteristics of high-temperature strength, high creep strength at high temperatures, high thermal fatigue resistance, good oxidation resistance, excellent heat corrosion resistance, good welding properties and ease of casting.

Tungsten and tungsten compounds are also extensively used as catalysts and in a number of other chemical reactions. A catalyst works by accelerating reactions that would normally be too slow or would not even take place. After the reaction, the catalyst remains essentially unchanged.

Tungsten has been classed as a ‘strategic’ metal due to the properties of the metal in terms of heat resilience and hardness. There are hundreds of different uses for the metal. Today, virtually all high speed cutting and drilling tools are made of steel alloys containing tungsten. The basic type has 18% tungsten, 4% chromium, 1% vanadium and 0.5 to 0.8% carbon.

Potential substitutes for cemented tungsten carbides include cemented carbides based on molybdenum carbide and titanium carbide, ceramics, ceramic-metallic composites (cements), diamond tools, and tool steels.
Commodity Overview

Tungsten Supply

China currently produces over 87% of total world tungsten production. This unhealthy dominance in the industry has been created through high volumes of low cost exports and otherwise poor market conditions throughout the 1980’s and 1990’s, driving most Western producers from the market. In the early 1990’s tungsten prices fell to a low of US$45/mtu for concentrates; however, many Chinese mines remained in production, buoyed by their generally higher grade ore bodies and the financial support given to the APT refineries by the Chinese government. As a result very little exploration and mine development outside of China took place over this period.

The table below shows ITIA worldwide production estimates and highlights China’s dominance over the global supply.

<table>
<thead>
<tr>
<th>2010 ITIA Global Production Estimates</th>
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</thead>
<tbody>
<tr>
<td><strong>Country/ Continent</strong></td>
</tr>
<tr>
<td>China</td>
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<tr>
<td>Russia</td>
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<tr>
<td>Bolivia</td>
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<td>Vietnam</td>
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<td>Austria</td>
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<td>Canada</td>
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<td>Thailand</td>
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<td>Brazil</td>
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<tr>
<td>Spain</td>
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<tr>
<td>Mongolia</td>
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<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Source: ITIA

Whilst China is the largest producer of tungsten, they are also the largest consumer, accounting for 50% of world demand, as well as being the fastest growing market. As a result of this growing domestic demand, the Chinese government has put in place numerous measures to consolidate and control its domestic tungsten industry including limiting the export of most forms of tungsten.

Outside China, few, if any, have the potential to materially increase production. At Cantung in Canada, the largest producer outside China, output is already at close to capacity with just 3 years ‘mine life’ available. Portugal’s Beralt mine has very little scope for significant expansion while the Mittersil mine in Austria produces tungsten principally for in-house use and is therefore unlikely to supply material to market.

The EU has now categorised tungsten as a ‘critical raw material’, while the British Geological Survey in the UK put tungsten at the top of its list of ‘supply-risk’ materials.
**Commodity Overview**

**Tungsten Demand**

Over the years of excess supply, stockpiles of tungsten were built up by producers and governmental organisations. These stockpiles overhung the tungsten market and tended to act as a brake on price rises. Most of the material contained in these stockpiles has now been sold and trends in tungsten prices have correlated more closely to the underlying supply/demand fundamentals since 2005/2006.

![Tungsten Supply and Demand: 2001 to 2010](image)

*Source: ITIA*

As with most metals, demand for tungsten suffered during the Global Financial Crisis and has struggled to post a substantial recovery since, with recessionary conditions continuing throughout most of Europe. In the longer term, however, the outlook for the tungsten demand is positive, with an expected growth rate of 6% p.a. to 2016 (Roskill Pty), driven by strong growth in China.

**WO₂ Concentrate Price, APT (Europe), US$/mtu**

![Tungsten Price History](image)

*Source: Bloomberg*
Directors & Management

Non-Executive Chairman
Patrick McManus

Patrick McManus brings over 30 years of diverse professional experience in the mining industry to the company. During his career Mr McManus has been involved with managing gold, iron, titanium, mineral sands and potash projects in locations all over the globe; including the Perth and Murray Basins in Australia, Madagascar, Indonesia and the United States. During this time Mr McManus has occupied technical, operational and corporate roles with Rio Tinto, RGC Limited and Bemax Resources. Mr McManus’ experience with small cap Australian listed resource companies includes Corvette Resources Limited, for which he was a founding director also the managing director from 2007-2010. Patrick also currently serves as the Managing Director of ASX-listed Potash West NL.

Executive Managing Director
Paul Berndt

Paul Berndt, a metallurgist by profession, has had extensive experience with tungsten, having served as the General Manager and Managing Director of Spanish tungsten miner, Daytal Resources, from 2008-2011. During his time at Daytal he transformed the struggling company into a successful, profitable operation and readied it for sale. Mr Berndt has also worked as a consultant for various tungsten mining companies, providing project development and process services for tungsten projects in Norway, Rwanda and Australia. With 37 years of experience in the mining industry, Mr Berndt has occupied operational, technical and managerial roles in countries such as Australia, South Africa, Zimbabwe, Indonesia, Chile, China and Peru specializing in project implementation, process design and operational management. Paul has worked with a variety of commodities including base and precious metals, coal and diamonds.

Non-Executive Director
Francis Loh

Francis Loh is an accountant by profession (Level 2 ACCA) has experience in South East Asian capital markets and significant commercial experience with Singaporean companies. He was previously the Finance Manager for Oriental Group Ltd, a Singaporean listed entity, from 2005 to 2012. Currently Francis is a director with a corporate advisory firm, providing personal investment planning and company restructuring services to a variety of clients.

Chief Financial Officer
Robert Van Der Laan

Robert Van Der Laan is a qualified accountant with more than 25 years’ experience in public and private companies. He is also the sole director of Richmond Resources Pty Ltd, the vendor of TGN’s 20% interest in the Callie Soak project. Robert was previously the CFO of Potash West (ASX: PWN).
**Analyst Verification**

We, Grant Craighead and Howard Humphreys, as the Research Analysts, hereby certify that the views expressed in this research accurately reflect our personal views about the subject securities or issuers and no part of analyst compensation is directly or indirectly related to the inclusion of specific recommendations or views in this research.

**Disclosure**

Breakaway Investment Group (AFSL 290 093) may receive consultancy fees and commissions on sale and purchase of the shares of Tungsten Mining NL and may hold direct and indirect shares in the company. It has also received a commission on the preparation of this research note.

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